Difficulties in changing existing leases – one explanation of the "energy paradox"?

Magnus Bonde
KTH Royal Institute of Technology, Stockholm, Sweden

Abstract

Purpose – The purpose of this paper is to investigate if a green lease could eliminate the split incentive problem in two office buildings located in Stockholm, Sweden. It aims to provide a theoretical overview concerning the "energy paradox" and to describe a case study in which a green lease was to be implemented in the legal framework for two office buildings in the Stockholm region.

Design/methodology/approach – This paper documents a case study, in which a green lease was to be implemented in the legal framework for two office buildings, to promote a more active engagement in the buildings energy performance. In order to accomplish this, a project group was formed which consisted of representatives from the building owners, tenant, property manager, energy consultants and KTH, Royal Institute of Technology, Stockholm.

Findings – This paper reveals that it is very hard to alter already legally binding agreements. Furthermore, it shows that the separation of ownership and usage of a building may not be optimal from an energy efficiency point of view.

Originality/value – The paper gives an empirical explanation as to why at times energy efficiency measures are not undertaken, even though the investments themselves bring about a positive net present value. In addition, the paper analyses the situation where property maintenance is outsourced to a property management firm, which is a common but seldom discussed situation in the literature.

Keywords Green leases, Energy efficiency, Energy consumption, Split incentives, Office buildings, Energy paradox, Energy efficiency gap, Sweden

Paper type Case study

1. Introduction

1.1 Background

Depending on a company's line of business, energy efficiency investments can be a more or less integrated part of the company's business strategy. For instance, investments' regarding energy efficiency is more common within energy intensive industries (e.g. production of aluminium) than within the commercial banking sector. Furthermore, national energy policy is of great importance, as subsidised energy prices reduce the investment pay-back (Schleich, 2009).

The European building stock accounts for a large share of the total energy usage in Europe (Commission of the European Communities, 2007) and the real estate sector, in total, has been identified by the Intergovernmental Panel on Climate Change (IPCC) as a sector where cost effective energy efficiency investments are feasible (IPCC, 2007; MISTRA, 2008). Even though much work has been undertaken, some argue that there exists an "energy efficiency gap", which is also known as the "energy paradox". This paradox consists of the notion that perceptible cost-effective energy efficiency measures are not being undertaken by market actors (Jaffe and Stavins, 1994; Swedish Government Official Report, 2008; Kok *et al.*, 2011).

Journal of Corporate Real Estate
Vol. 14 No. 1, 2012
pp. 63-76

1463-001X
DOI 10.1108/14630011211231446

1.2 Purpose and research question

The main purpose of this paper is to study the obstacles for energy efficiency investments in the Swedish commercial office sector and to investigate if these obstacles can be neutralised with the adoption of green leases. Obstacles that hamper market efficiency are referred to as "market failures" and/or "market barriers". Examples of these are, for instance, split incentives, asymmetric information and transaction costs.

The theoretical purpose of a green lease is to eliminate the split-incentives problem and to create economic incentives for both the landlord and the tenant to undertake energy efficiency measures. In addition, the green lease formalises the co-operation concerning the property related environmental issues between the tenant and landlord.

This paper describes a case study of two Stockholm office buildings. The purpose of the study was to identify the split incentive problems and to investigate if a green lease could be implemented into the legal framework, with the purpose of eliminating these issues.

2. Method

2.1 Selection of study objects

The project arose from an energy consultancy, which had undertaken an energy review (ordered by the tenant) of two single-tenant office buildings (with the same tenant) in the Stockholm region. Even though there were numerous improvements identified, none of the proposed energy efficiency investments was carried out. The consultancy firm wanted to examine the underlying reasons for inaction. After the main idea was established between the stakeholders (real estate owners, tenant and property manager), Kungliga Tekniska Högskolan (KTH) was invited to be involved as an academic partner to study the parties' incentives and to document and evaluate the process and the results of the project.

In this project a holistic multiple-case ("two-case") design was used. The reason for this being that even if the buildings had similarities, such as single-tenant occupation and equal technical standards, the maintenance and operating costs were allocated differently. By including both buildings in the case study the researchers could evaluate if the different set-ups could have an impact on the outcomes. In addition, both buildings were considered representative of office buildings in the Stockholm region from the 1960s and 1990s. Furthermore, the research team had access to leases, agreements and involved employees, which are essential when choosing case study objects (Yin, 2009).

2.2 Process and methodology

At the start-up meeting, a project group was formed. It consisted of representatives' from the tenant, the two landlords, property manager, energy consultancy firm and KTH. One of the energy consultants and KTH researcher had the overall responsibility for conducting the interviews, studying agreements between the parties, and outlining solutions. A person from the energy consultancy firm was responsible for the project, named "Från ord till handling" ("From words to action").

This research adopted a qualitative approach, and a very common method of data collection is through participatory observation. This research approach uses a combined technique consisting of simultaneously analysing documents, conducting interviews with respondents as well as to direct participation and observation

(Denzin, 1989 cited in Flick, 2009). Additionally, this technique provides the opportunity to observe the process from the "inside", which some claim is a more accurate way of describing a case (Yin, 2009). This data gathering technique was used in the first phase of the project, in which a literature review and interviews were conducted. Additionally, the leases and agreements between the different parties were studied.

In the next phase, an energy consultant and KTH researcher worked at finding solutions to put forward to the participators' to improve the buildings energy performance (by eliminating the split incentive problems). In this stage additional agreements such as green leases, which included new co-operation practices between the parties were outlined.

In the final phases the new agreements and practices were meant to be implemented and evaluated. However, as is explained, the project never got to this phase and no new agreements/practices were implemented.

This project was an action research project, which has the characteristic of both generating knowledge as well as improving the studied subject (Kock, 2011).

3. The energy paradox

Rational market actors will, in accordance with economic theory, undertake all investments that result in a positive net present value (NPV). In the real estate sector, on the other hand, it is argued that investments regarding energy efficiency are not being conducted to their full extent, even though they bring about a positive NPV. This phenomenon is often referred to as the "energy efficiency gap" or the "energy paradox" (Swedish Government Official Report, 2008). Depending on the definition of this eventual gap, some argue it is large while others argue it is quite small and almost non-existent (van Soest and Bulte, 2001; Jaffe and Stavins, 1994; IVA, 2009; Högberg, 2011). From an economic perspective, barriers that may hamper a more energy efficient real estate sector are referred to as "market failures" and/or "market barriers".

3.1 Market failures

Market failures have a negative impact on a society's economic efficiency, which will result in a non-optimal resource allocation. Therefore, governmental interventions can be justified, as long as the intervention passes the cost-benefit test (as a more efficient resource allocation):

- *Asymmetric information.* Asymmetric information is a common feature, both within an organisation and in the society as a whole. For instance, a developer will have an information advantage, in comparison to the end-user, about the buildings technical standard. If the building uses a great deal of energy, a rational developer will be reluctant to hand that information to the final end-users. Because of this, the property's energy performance will not be properly evaluated. This problem can be resolved by a third-party energy certification system such as the European energy performance certificate (EPC).
- *Externalities.* Most production and consumption cause's externalities, but these are usually hard to price in a market. All energy production causes more or less negative externalities, such as air pollution. Because these externalities are not priced, the overall price of the energy will be "too low" from a societal point of view, which will result in a "too high" usage of energy.

- *Split incentives.* A split incentive occurs when market actors have diverse incentives, due to the set-up of the agreement between them. One example is called the "landlord-tenant dilemma"; if the landlord does not pay the electricity bill, the incentive to regard energy performance for capital goods will be reduced. Furthermore, this will lower the landlord's incentives to modernise capital goods and, ultimately, an "efficiency problem" can arise. This problem can be solved by letting the landlord pay the electricity bill, but this lowers the incentives for tenants to reduce electricity usage, because they no longer have an economic incentive for lowering electricity usage and the outcome could be deemed a "usage problem" (Swedish Government Official Report, 2008; Swedish National Board of Housing, Building and Planning, 2005; International Energy Agency, 2007; Schleich, 2009; van Soest and Bulte, 2001).

3.2 Market barriers

A market barrier explains why certain economical activities are not carried out to their full extent. In contrast to market failures, these barriers are not a signal of market inefficiency, and therefore governmental interventions are not justified:

(1) *Transaction costs.* Transaction costs include all costs that are required for a transaction to occur (e.g. time, money or effort). These costs cause a higher "total" price for the commodity. Are these costs to a larger extent "paid" by the buyer, or if the demand is price sensitive, it will result in a lower overall demand for the product. Examples of transaction costs that are common regarding energy efficiency investments are time costs for finding and assimilating information as well as costs for hiring energy consultants.

(2) *Uncertainty.* By its nature, all investments are associated with a degree of uncertainty. Regarding energy efficiency investments there are a number of uncertainty factors, such as:

- The price development on the energy market.
- Technical risk (e.g. if products do not work as planed or demand more maintenance than is estimated).
- Future investment option (i.e. the option to do a better energy efficiency investment in the future).

These elements of uncertainty bring about an increased risk premium, which ultimately has a crucial impact on the investments profitability. In addition, uncertainty regarding the future development of new, more energy efficient technologies, could have an ambiguous effect on the implementation of new energy efficient technologies in the present. If the development of new, more effective, energy efficiency measures is rapid, it can be rational for an actor to postpone an energy efficiency investment today, because a better, more efficient, measure would be available in the near future. However, as a breakpoint is reached (an even more rapid development of energy efficiency measures), rational actors will, to a larger extent, implement energy efficiency measures sooner, because the earnings made today will be greater than the option to postpone the investment (van Soest and Bulte, 2001).

Furthermore, the time aspect can have an impact on the actors' willingness to conduct energy efficiency investments. If either the landlord or the tenant has

a short-term approach, energy investments with longer pay-back times will be set aside. This situation is more common in real estate markets where leases are shorter (Swedish Government Official Report, 2008; Swedish National Board of Housing, Building and Planning, 2005; International Energy Agency, 2007; Utveckling av Fastighetsföretagande i Offentlig Sektor, 2009; Schleich, 2009).

4. "Green" leases

There is no official definition of a "green" lease and it can be argued that all commercial leases can become "greener". A green lease can either be a new lease or an additional agreement, as a supplement, to the primary lease (Hinnells *et al.*, 2008). The core purpose of green commercial leases is to accomplish a more effective collaboration between tenant and landlord regarding energy and environmental issues. The most common issues that green leases handle are:

- *Benchmarks and targets.* Green leases incorporate different forms of environmental performance targets, either as an absolute target or a percentage reduction of an objective. These performance objectives' usually consists of energy/water usage, recycling or waste reduction.
- *Ecologically sustainable development principles and regulations.* These sections usually constitute base-lines regarding the indoor environment, recycling and rebuilding policies.
- *Performance standard.* How the environmental performance should be measured and evaluated.
- *Dispute resolution mechanism.* Guidelines for how to resolve disagreements between the parties, for instance, if certain environmental targets have not been met.
- *Environmental management plan (EMP) and a green lease schedule (GLS).* An EMP is usually a part of a GLS, which is a common feature in the green leases developed in Australia (Brooks, 2008).

Green lease can have different "shades of green", depending on the obligations and commitments made by the involved parties. "Light" green leases could be considered as a declaration of intention, in which no specific environmental targets or sanctions are incorporated into the agreement, while "dark" green agreements include more specific environmental performance targets, as well as possible economic incentives/sanctions if either party have fulfilled/not fulfilled its obligations (Hinnells *et al.*, 2008).

4.1 International examples of green leases

In Great Britain the Centre for Research in the Built Environment, in co-operation with King Sturge, Eversheds, Wales Environmental Agency and Royal Institution of Chartered Surveyors has outlined a guide to a "greener" lease. This lease is tailored for multi-tenant buildings and has a "light green" character. The agreement regards the following attributes; maintenance, repairs and rebuilding, utility costs and rent, but can be tailored in accordance to the involved participants' environmental goals (Hinnells *et al.*, 2008).

In Australia a GLS has been developed for the public sector. The GLS is mandatory when leasing office space over 2,000 square metres and for leases of two years duration

or more (unless an exception is given by the authorities). The GLS is designed as an additional agreement to the lease, and has a "dark green" character. The GLS regards the following five aspects; energy performance (4.5 stars NABERS Energy), separated metering, energy management plan, building management committee and disputes and remedies clauses. Eight versions of the GLS have been developed, accommodate to building types and usage (Hinnells *et al.*, 2008; Department of Climate Change and Energy Efficiency, 2011).

4.2 Swedish examples of green leases

Over the last few years green commercial leases have gained more attention in Sweden and property companies such as Vasakronan and Landstingsfastigheter Dalarna, as well as the real estate association BELOK, have developed green agreements. All these agreements are designed as an additional contract to the primary lease:

- *Landstingsfastigheter Dalarna (managing mostly hospital buildings for a regional authority).* The tenant's obligations here mostly consist of assisting the maintenance staff, to regard energy and water efficiency when purchasing new equipment, recycle waste and inform the employees. The landlord's obligation is to be proactive regarding environmental improvements in the premises and provide the property manager with incentives to reduce environmental impact. The set-up of the incentive structure is as follows; the landlord and property manager shares cost reductions and increases regarding building operating costs. The ambition of the landlord is to have an annual reduction of energy of 1.5 to −2 per cent.

  As an incentive for the tenant, the landlord offers a 2 per cent reduction on the rent, as long as the tenant fulfils his obligations (Landstingsfastigheter Dalarna, 2011; Utveckling av Fastighetsföretagande i Offentlig Sektor, 2009).
- *Vasakronan (a large owner of office properties in Sweden).* This agreement is outlined as an additional agreement to a gross lease. The tenant has to accept a "dynamic" indoor climate, which implies larger temperature variations over the day and time of year. Furthermore, the agreement stipulates that all electricity bought on the market has to come from renewable sources, in accordance to the Swedish Society for Nature Conservations criteria's ("Bra miljöval"). As an economic incentive for the tenant, the landlord offers 10 per cent of the cost reductions that can be derived to variations in the indoor temperature. In addition, the landlord finances an energy review of the tenant's premises, in order to find cost-effective energy investments. The agreement also stipulates that the landlord uses recycled materials and/or environmentally friendly materials when rebuilding/maintaining the premises, if it is economically sound (Vasakronan, 2010).
- *BELOK.* BELOK is a co-operation between the Swedish energy agency and Sweden's biggest commercial real estate owners. A green lease standard has been established and is called a "lease with incentives to reduce energy usage". There are three versions of the lease, one simplified and two more comprehensive versions (depending if the underlying lease is a gross or net). As a starting point an energy review is conducted (financed in accordance with the green agreement), which quantifies the buildings energy and water usage.

Depending on how the agreement is finally outlined, the tenant and landlord have different obligations, for instance encouraging maintenance personal, informing employees about energy efficient behaviour and supply data to maintenance personal (BELOK, 2008).

5. Implementing green leases/agreements: Case 1

The building in which the green lease was meant to be implemented was a single-tenant office building, built in the beginning of the 1990s. The property constituted an office, a restaurant and server centre. The building had been owned by the tenant, but was now owned by an international real estate investor. The landlord had outsourced the entire operation of the building to a property management firm.

5.1 Pre-study

Initially the three current agreements between the involved parties were examined, and interviews were conducted with the respective company representatives. The lease between the landlord and tenant stipulated that the landlord paid the heating expenses and a fixed payment that was meant to cover the property electricity usage (because it was not possible to separately meter business and property electricity), while the tenant paid the cooling and electricity bills. The letting of the entire property consisted of four leases (for each quarter of the leased demise) with different expiry dates, which ranged from due within a two to around ten years. The agreement between the landlord and property manager was a long term, fixed payment contract (including replacements costs), with no economic incentive to reduce energy consumption. It stated only that "to a reasonable extent, energy efficiency should be regarded when executing the services". These agreements result in different incentives for the involved parties to reduce utility costs (heating, business electricity, property electricity and heating, ventilation and air conditioning (HVAC) electricity), as seen in Table I.

What is noteworthy is that the property manager, with the greatest ability to reduce energy consumption, does not have any direct economic incentive to reduce utility costs. Of course the property manager has an indirect economic incentive; if they perform poorly during this contract period it will be harder to achieve renewal of the contract, but this is a very weak incentive as a renewal of the contract depends on many different factors.

Interview with tenant. The tenant representative was initially reluctant to finance investments to another party's property, even if the pay-back period was short. One of the reasons that they sold the real estate was that they did not want to be involved in its maintenance. On the other hand, given the outline of the lease the tenant had an economic inventive to reduce utility costs and therefore had financed minor investments in the property's ventilation systems (the pay-back period for this investment was about one year).

	Landlord	Property manager	Tenant
Heating	Yes	No	No
Business electricity	No	No	Yes
Property electricity	No	No	Yes
HVAC electricity	No	No	Yes

Table I. Stakeholders economic incentive to reduce utility costs

The tenant's main interest regarding energy efficiency measures was to reduce utility costs and to comply with the company's environmental goals, which focused on an overall carbon dioxide reduction target for the entire corporate group. To comply with the environmental goal the tenant had started to buy renewable energy on the Swedish market. Due to this, the tenant mainly focused on carbon reduction measures in other countries, which typically consisted of buying renewable energy.

The main obstacles for a more efficient use of energy from the tenants point of view was the demarcation of responsibility between the landlord and tenant, as well as involving their staff to consider energy usage in the daily work such as turning off computers.

Interview with property manager. The property manager had a very weak incentive to regard building energy performance. Instead they focused mainly on reducing the "wear and tear" of the technical installations, because a longer technical life would benefit the property manager economically. Additionally, the property manager had no access to the lease between landlord and tenant (with the demarcation list), which made it hard for them to be proactive to either party. The property manager had become more interested in energy efficiency matters, because they wanted to promote their "green" services. In addition, the property management firm was certified in accordance to the ISO 14001 standard.

Interview with landlord. The landlord's objective regarding energy efficiency investments was to reduce utility costs and therefore he focused only on reducing costs related to heating. The landlord regarded operating costs as risks and mainly preferred net leases.

Concluding remarks. The overall impression from the pre-study was the lack of communication between the different parties, where each participant was sub-optimising in isolation. This was illustrated by the fact that the EPC had not been done, even though it is mandatory for Swedish commercial real estate owners. As a further example, the energy review of the building, which was ordered by the tenant, had not been forward to the landlord.

5.2 Proposal

The allocation of utility costs (separation of heating and cooling costs) was not considered to be optimal from an energy efficiency point of view. Therefore, our suggestion was to renegotiate the lease into a net lease (the tenant would then get a lower rent as compensation for the additional heating costs). The selection of a net lease depended mainly on the fact that it was thought easier to carry through than a gross lease, given that the property was owned by a "passive" distant owner. Furthermore, the tenant had more ambitious environmental goals, compared to the landlord.

It was also proposed that an employee from the property management team was to have the overall responsibility for the buildings entire energy performance the position of Energy Controller. In addition, the property manager would get half of the cost reduction due to energy efficiency measures, to create a stronger incentive to undertake such activities. These suggestions would be included in a green lease between the tenant and the landlord. This proposal creates a situation with a very passive landlord and a more active property manager and tenant.

5.3 Process

Even though all participants generally accepted the scheme, the weakness in the proposal was exposed during the implementation process. The tenant was still quite reluctant to finance greater investments in the property to any larger extent, even though he would pay all the utility bills. According to the tenant it would be more favourable, due to accounting reasons, that the landlord financed these investments. As discussions progressed, a plan of major investments, in accordance with an additional, more profound, energy review that had been ordered in the start-up period, was formulated. This package of investments was to be financed by the landlord, who would be reimbursed with additional rent. In addition to these initial energy efficiency investments, the tenant and landlord would enter into a green lease, which was meant to be mirrored by an additional agreement between the landlord and property manager. However, the energy review showed that all the cost-efficient investments would only decrease energy usage by about 13 per cent, with a pay-back period of four to five years. This fact, among others, lead to the discussions of structuring a "new" net lease being abandoned.

At this stage the possibility that the tenant and property manager could enter into a "green" agreement was examined. By doing this a platform for future energy investments albeit on a smaller scale could be created. This agreement would, for instance, stipulate; how eventual future cost savings should be divided, how investments should be financed, who would monitor the buildings energy performance (the Energy Controller function) and meeting schedules. The building manager was the natural choice for monitoring energy performance. A more complex question was how energy savings was to be measured; should actual energy savings (using utility bills) or theoretical energy saving calculations be used as a baseline? In the end, it was decided that it would be more practical to use theoretical calculations, mainly because of the lack of differentiated energy metering, which made it hard to monitor the specific energy efficiency measure's effect on the actual energy usage in the building. However, this meant that the parties must have a greater trust in one another.

5.4 Result

As the project was finalised, no new agreements had been signed. The reasons for this result are multiple and keys ones are highlighted as follows:

- *Difficulties in changing existing leases.* The tenant and landlord could not agree on a new, "net lease", rent level. What also complicated matters was the fact that if the landlord would finance the energy efficiency investments, he would need an additional rent, which did not simplify matters.
- *Complex lease structure.* The tenant and landlord did not have one agreement for letting the entire building, but instead had four leases for each quarter of the leased premises. These agreements had different expiry dates, ranging from two to almost ten years. This made the transition to a net lease structure even more difficult.

Besides these circumstances, the negotiations were time consuming involving many people. Additionally, at the end of the process the tenant announced that they intended to leave the premises, which weakened the will to enter a new agreement.

Nevertheless, after the project ended the tenant decided to undertake some of the proposals made in the energy review. The investments concerned cooling and/or electricity (which utility bills was paid by the tenant) and had a pay-back time of less than two years. These investments were financed by the tenant.

6. Implementing green leases/agreements: Case 2

The premises could more or less be considered as a single-tenant building (the tenant occupied about 4/5 of total leasable area). It had been constructed during the 1960s, but two-thirds of the building had been renovated during the late 1990s. The renovated parts had quite good energy performance, while the technical standard in the third (un-renovated part) was not as good. As in Case 1, it was not possible to meter the business and property electricity separately. The building had earlier been owned by the tenant but had been sold to a Swedish real estate firm in a sale-lease back transaction in the end of the 1990s.

6.1 Pre-study

As a starting point the agreements between the parties were read and separate interviews with company representatives were conducted. The lease was a gross-lease, where the landlord paid the utility bills for heating and cooling (and indirectly property electricity), and the tenant paid the electricity invoice. As in the former case, the landlord paid a fixed amount for the property electricity, because it could not be individually metered. This set-up eliminated the incentive for the landlord to reduce the property electricity usage. The lease of the whole premises consisted of two leases with the same expiry date, which was due in around two years. The lease set-up resulted in different incentives to reduce utility costs (heating, business electricity, property electricity, HVAC cooling), as seen in Table II.

As observed in Table II, most incentives to reduce energy usage are correctly allocated. In this case, the main issue was to create incentives for the landlord to consider the property electricity usage as well as incentives for the tenant to consider heating and cooling usage. The dialogue between the tenant and landlord regarding these issues was fairly good and they had made a joint investment previously.

Interview with tenant. The interviews with the tenant representatives revealed they were reluctant to invest in another party's property, even if the investment had a short pay-back time. As mentioned above, it had happened once in collaboration with the landlord, though they felt still that the real estate owner should finance the investments, which was a reason why they had sold the property previously.

The tenant's incentive for energy efficiency was to reduce operating costs and comply with their environmental policy, which consisted of an overall target for carbon dioxide reduction for the entire corporate group. As a result of this policy, the tenant

Table II.
Landlord and tenant economic incentives to reduce utility costs

Economic incentive	Landlord	Tenant
Heating	Yes	No
Business electricity	No	Yes
Property electricity	No	Yes
HVAC electricity	Yes	No

had started to buy renewable energy on the Swedish energy market. By doing so, the tenant had a stronger focus on carbon reduction measures in other countries, which most often focused on buying renewable energy.

From the tenant's perspective, the main obstacle for increased energy efficiency was the demarcation of responsibility between landlord and tenant, as well as getting their employees to consider energy usage more seriously in the day-to-day work.

Interview with the landlord. Interviews with the landlord revealed they had ambitious environmental goals and this included a reduction target for the energy usage in the building. On the other hand, they only conducted energy investments which gave an economic benefit (by reduced utility costs). The main issue was that the landlord only regarded the heating and cooling costs, because they did not have any economic incentive to reduce property electricity, due to the fixed payment to the tenant. The landlord used in-house maintenance personal, mainly because they believed that it resulted in better relations with its tenants.

6.2 Proposal

As mentioned above, the main issues were to give the landlord incentives to regard the property electricity usage, as well as to get the tenant to consider the costs associated with heating and cooling the building. The proposal in this project was to implement a "dynamic" indoor climate; which means that the tenant accepts larger temperature changes during the day and time of year. In doing so, the tenant would be allowed a part of the cost reductions that could be due to the "dynamic" indoor climate. In order to create an incentive for the landlord to regard property electricity, we proposed a model where the tenant and landlord financed investments and shared the economic benefits of reduced electricity costs. Furthermore, it was suggested that an Energy Controller function was introduced to have the overall responsibility for the buildings energy performance. These suggestions would be embodied in a green lease between the landlord and tenant.

6.3 Process

Foremost, the researchers wanted to establish a more efficient procedure regarding decisions that affected the whole building energy performance. In this procedure the Energy Controller would play a vital role, but as the project went along the Energy Controller function was abolished because it was considered too costly and the landlord already had a property management team in place. As in the first case, there was discussion about how energy efficiency investments were to be measured, using theoretical calculations or measuring actual energy savings. As in the former case, it was decided that using theoretical calculations was considered more practical.

6.4 Result

When the project was finalised, the landlord and tenant had not come to any new agreement; the main reason being technical as well as organisational matters. The technical difficulties consisted of getting accurate data regarding airflows, indoor temperature, etc. This information was of great importance because it showed if the measure affected the indoor climate or not, which in turn determined if the earnings from the investments was to be divided between the landlord and tenant or accrue solely to the landlord. Furthermore, as the project involved many people the negotiations became

time consuming, which stalled the process. Finally, the tenant decision to leave the premises clearly had a negative effect on the process.

7. Conclusions

This case study indicates that changing existing lease structures is an extremely complicated matter, and therefore is associated with large transaction costs. This fact, among others, could be one explanation of the "energy paradox". Additionally, this project shows that complex contractual agreements involving different parties easily can create split incentives regarding energy efficiency. In addition, obsolete technical installations in the building can make it hard to monitor energy usage, which makes it harder to evaluate energy efficiency measures. Furthermore, a short lease length weakens the incentive to conduct major energy investments, because these usually have longer pay-back times and the investor (landlord/tenant) wants to write-off the investment during the lease term. All in all, the project shows that separation of ownership and usage may not be optimal from an energy efficiency point of view.

There is also the emotional aspect of investing in somebody else's property to consider. The tenant typically considers building improvements' as the landlord's obligation. On the other hand, it seems that a tenant under some conditions may be willing to carry out minor investments (one outcome in Case 1). Regarding this fact, it seems that the incentives for the landlord are more crucial, since he will be the one conducting the major investments in the property. Therefore, a gross lease may be preferable if we want to improve the overall energy performance of the building stock.

Finally, the uncertainty about the tenant's retention is very important. When the tenant in this project announced the intentions to vacate the premises' the project more or less came to a standstill.

Nevertheless, this case study approach could be used as a setting for implementing green leases/energy efficiency operation methods in commercial buildings in other cases (in different geographic areas). By doing this more cases could be analysed and improved conclusions could be drawn. If these agreements became more widespread, a quantitative study would be possible. Finally it would be interesting to investigate if these agreements actually deliver significantly lower energy usage in commercial premises.

References

BELOK (2008), "Hyresavtal med incitament för minskad energianvändning", Slutrapport, available at: www.belok.se/docs/Hyresavtal/Slutrapport_Hyresavtal_med_incitament_for_minskad_energi.pdf (accessed 11 August 2011) (in Swedish).

Brooks, S.M. (2008), "Green leases and green buildings", *Probate and Property*, Vol. 22 No. 6, pp. 22-34.

Commission of the European Communities (2007), "A lead market initiative for Europe", Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the regions, available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0860:FIN:en:PDF (accessed 11 August 2011).

Department of Climate Change and Energy Efficiency (2011), "Green lease schedule", Australian Government, available at: www.climatechange.gov.au/government/initiatives/eego/green-lease-schedule.aspx (accessed 13 December).

Flick, U. (2009), *An Introduction to Qualitative Research*, Sage, Basingstoke.

Hinnells, M., Bright, S., Langley, A., Woodford, L., Schiellerup, P. and Bosteels, T. (2008), "The greening of commercial leases", *Journal of Property Investment & Finance*, Vol. 26 No. 6, pp. 541-51.

Högberg, L. (2011), "Individual metering and charging in rental housing: creating the right incentives for energy savings?", in Högberg, L. (Ed.), *Incentives for Energy Efficiency Measures in Post-war Multi-family Dwellings*, Royal institute of Technology (KTH), Stockholm.

Intergovernmental Panel on Climate Change (2007), "Residential and commercial buildings", in Metz, B., Davidson, O.R., Bosch, P.R., Dave, R. and Meyer, L.A. (Eds), *Climate Change 2007: Working Group III. Mitigation of Climate Change*, Chapter 6, available at: www.ipcc.ch/publications_and_data/ar4/wg3/en/ch6.html (accessed 15 June 2010).

International Energy Agency (2007), "Mind the gap: quantifying the principal-agent problems in energy efficiency", available at: www.iea.org/textbase/nppdf/free/2007/mind_the_gap.pdf (accessed 11 August 2011).

IVA (2009), "Energieffektivisering – möjligheter och hinder", available at: www.iva.se/Documents/Publikationer/Projekt/4_ENERGIEFFEKTIVISERING_web.pdf (accessed 11 August 2011) (in Swedish).

Jaffe, A.B. and Stavins, R.N. (1994), "The energy-efficiency gap: what does it mean?", *Energy Policy*, Vol. 22 No. 10, pp. 804-10.

Kock, N. (2011), "Action research: its nature and relationship to human-computer interaction", in Soegaard, M., Soegaard, D. and Rikke, F. (Eds), *Encyclopedia of Human-Computer Interaction*, available at: www.interactiondesign.org/encylopedia/ation_reasearch.html (accessed 2 December).

Kok, N., McGraw, M. and Quigley, J. (2011), "The diffusion of energy efficiency in building", *American Economic Review: Papers and Proceedings*, Vol. 101 No. 3, pp. 77-82.

Landstingsfastigheter Dalarna (2011), "Miljökontrakt" (in Swedish).

MISTRA (2008), "The value of environmental and social issues to real estate investors", available at: www.mistra.org/download/18.39aa239f11a8dd8de6b800026760/Report+from+Mistra+Real+Estate+seminar.pdf (accessed 11 August 2011).

Schleich, J. (2009), "Barriers to energy efficiency: a comparison across the German commercial and service sector", *Ecological Economics*, Vol. 68 No. 7, pp. 2150-9.

Swedish Government Official Report (2008), "Vägen till ett energieffektivare Sverige. Slutbetänkande av Energieffektiviseringsutredningen", SOU 2008:110, Näringsdepartementet, Stockholm, available at: www.regeringen.se/content/1/c6/11/58/55/94065b3d.pdf (accessed 4 May 2010) (in Swedish).

Swedish National Board of Housing, Building and Planning (2005), "Piska och Morot – Boverkets utredning om styrmedel för energieffektivisering för energieffektiviseringar i byggnader", available at: www.boverket.se/Global/Webbokhandel/Dokument/2005/piska_och_morot.pdf (accessed 11 August 2011) (in Swedish).

Utveckling av Fastighetsföretagande i Offentlig Sektor (2009), "Klimatsmart brukarsamverkan – Arbetssätt för sänkt energianvändning" (in Swedish).

van Soest, D.P. and Bulte, E.H. (2001), "Does the energy-efficiency paradox exist? Technological progress and uncertainty", *Environmental and Resource Economics*, Vol. 18 No. 1, pp. 101-12.

Vasakronan (2010), "Grönt hyresavtal utan avläsning" (in Swedish).

Yin, R.K. (2009), *Case Study Research: Design and Methods*, 4th ed., Sage, Thousand Oaks, CA.

Corresponding author
Magnus Bonde can be contacted at: magnus.bonde@abe.kth.se